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**Jian**

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(54) **MULTILAYER OPTICAL FIBER COUPLER**

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- (58) Field of Search ..... **385/33, 88-94**

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(57) **ABSTRACT**

A multilayer optical fiber coupler for coupling optical radiation between an optical device and an optical fiber, including a first layer that has a fiber socket formed by photolithographic masking and etching to extend through said first layer, and a second layer bonded to the first layer. The first layer may comprise substantially single-crystal silicon. An optical fiber is inserted into the fiber socket to align the optical fiber precisely within the fiber socket. In one embodiment the optical fiber is a single mode fiber, and an optical focusing element formed on the second layer is aligned with the core of the single mode fiber. The second layer may comprise glass having an index of refraction that approximately matches the index of the optical fiber, and an optical epoxy is used to affix the optical fiber into the fiber socket and fill the gaps between the end face of the fiber and the second layer. Embodiments are disclosed in which an optical device such as a VCSEL or photodetector is bonded to the second layer. Alternative embodiments are disclosed in which the optical device is incorporated into the second layer. Advantages include reduced cost due to batch fabrication techniques, and passive alignment of the optical fiber.

**29 Claims, 8 Drawing Sheets**

